

**BRONCHIECTASIS: ITS DIFFERENTIATION FROM
PULMONARY TUBERCULOSIS.**

By B. STIVELMAN, M.D.,

MEDICAL SUPERINTENDENT, MONTEFIORE HOME COUNTRY SANATORIUM, BEDFORD
HILLS, N. Y.(From the Tuberculosis Pavilion of Montefiore Home and Hospital, New York City,
and Montefiore Home Country Sanatorium, Bedford Hills, N. Y.)

THE importance of detecting pulmonary tuberculosis in its early stages has frequently and justly been dwelt upon, but many patients exhibiting symptoms and signs suggestive of advanced disease of the lungs have often been denied a careful investigation of the nature of their affection. The multifarious lung lesions produced by the tubercle bacillus and the extreme variation in the clinical course of any given group of cases have often influenced us to attribute signs, in the lungs deviating from the normal, to phthisis pulmonalis, the common disease, when in reality such signs, when carefully analyzed, after the history of the case is accurately ascertained, are found to be due to pathological changes, non-tuberculous in character.

In view of the growing tendency to isolate the "advanced consumptive," such cases have frequently been banished to hospitals for the tuberculous or to distant climatic health resorts, at great expense and inconvenience, branded with the stigma of tuberculosis before the nature of the disease in their lungs had been definitely determined.

To obviate such occurrences, many authors have, in recent years, emphasized various chronic lung affections simulating pulmonary tuberculosis. Some observers call attention to chronic non-tuberculous lung infections involving the lower lobe of either or both lungs; others describe conditions affecting the upper lobe. Syphilis of the lung is mentioned as a possible but rare source of error, and it has also been shown that chronic bronchitis and heart conditions at times give rise to moisture on auscultation, diminished resonance on percussion and subjective symptoms, such as cough, expectoration, etc. Yet surprisingly little has been said of bronchiectasis, although this disease resembles certain types of pulmonary tuberculosis most closely.

Bronchiectasis, it is true, will rarely if ever be confused with acute progressive phthisis, which runs a rapidly wasting course, with chills, fever, sweats, emaciation, etc.; but it will, with difficulty, be differentiated from that form of tuberculosis characterized by mild constitutional symptoms, little or no wasting, with physical signs suggestive of marked fibrosis. Indeed, the resemblance of bronchiectasis to such cases of phthisis pulmonalis is so great that

unless careful observation is afforded for a considerable length of time, and all modern diagnostic methods are applied, a differential diagnosis may be impossible. The cases of bronchiectasis which form the basis of this communication are a few of those sent to us as "advanced consumptives," and are reported in these columns with the intention of demonstrating the salient points that help us in the differential diagnosis.

Among the more difficult to diagnosticate are those cases in which careful thermometry reveals an elevation of temperature in the afternoon hours. The fever, together with the cough, expectoration and blood-streaked sputum, are frequently considered to be due to tuberculosis. It must be pointed out, however, that afternoon temperature is not uncommon in the older bronchiectatics and in those who, enfeebled for various reasons, do not efficiently expel their bronchial contents. In order to arrive at a definite diagnosis in such cases a painstaking analysis of the clinical history and repeated physical and sputum examinations are essential. The history will most usually disclose absence of early constitutional symptoms of toxemia and fair health in spite of distressing cough and profuse expectoration; the physical examination will reveal a unilateral lesion, most frequently involving one of the lower lobes. Repeated examination of the sputum will not show the presence of tubercle bacilli. The following case illustrates these points very clearly:

CASE I.—Late bronchiectasis, with mild constitutional symptoms, due to retention of secretion, with autopsy findings.

S. B., aged fifty-six years, housewife, admitted October, 1916. She had measles and cholera in infancy, pneumonia at six years of age and again three years before admission. She had frequent attacks of "la grippe" since her last illness.

Present Illness. Since the pneumonia, three years ago, the patient has been subject to frequent colds, with more or less constant cough, which gradually became more and more distressing. Expectoration, at first scanty, became profuse and pain was soon complained of in the lower part of the right chest posteriorly. For the last fourteen months her sputum has at times been blood-streaked; she lost twenty pounds in weight and has been suffering from marked shortness of breath. On physical examination we found a fairly well-nourished individual; the cheeks, lips and finger-tips were slightly cyanosed; the fingers were clubbed and the nails markedly curved. The right chest was somewhat retracted in the supra- and infraclavicular spaces; slight atrophy of the muscles of the right supraspinous fossa was also noticed. Physical exploration of the chest showed very markedly impaired resonance throughout the entire right chest, the note being flat in the region of the lower lobe. Breath sounds were bronchial over the upper half of the right chest, both anteriorly and posteriorly, and cavernous

over the middle lobe. Throughout the right lung large, moist, consonating rales were heard and whispered pectoriloquy was elicited over the middle lobe. The left chest was emphysematous.

While at the hospital her cough increased in severity, expectoration averaging 450 c.c. in twenty-four hours; it was fetid and separated into three distinct layers on standing. Her temperature frequently rose to 101° in the afternoon, but the pulse was only slightly accelerated. On numerous examinations of the sputum tubercle bacilli could not be found. The urine was negative. The Wassermann reaction of the blood was negative; blood-pressure was 118 systolic and 86 diastolic.



FIG. 1.—Patient B. S. Left lung: Marked hilus changes; otherwise negative. Right lung: Diffuse infiltration throughout the lung most marked at the middle lobe with evidence of a great many dilated bronchi. Heart moderately enlarged and slightly pulled to right. Arch of aorta moderately dilated. Evidence of pleuropericardial adhesions.

Roentgen-ray examination (Fig. 1) disclosed marked hilus changes in the left lung; otherwise negative. Right lung: diffuse shadow throughout the entire lung, most marked at the middle lobe, with evidence of a great many dilated bronchi. Heart was moderately enlarged and slightly pulled to the right. The arch of the aorta was moderately dilated. Right diaphragm elevated and evidence of pleuropericardial adhesions was noted. Interlobar fissure was thickened.

Because of the history of pneumonia immediately preceding the present complaint the absence of fever in the early stage of the

disease, comparatively slow pulse, the profuse and periodically fetid expectoration, fair nutrition, with a history of cough of three years' duration, the negative findings in the profuse expectoration and the absolute unilateral involvement more marked at the lower lobes, a diagnosis of bronchiectasis was made and the patient was transferred to a non-tuberculous ward of the hospital. Here she grew progressively weaker, began to show signs of right heart insufficiency and died eight months after admission.



FIG. 2.—Patient B. S. Note the various-sized cavities throughout the lung. One large cavity communicates with a bronchus (split open) at the middle lobe.

Postmortem examination revealed the following condition: A few pleural adhesions in the left lung; otherwise negative. The right pleura was markedly thickened, and very firm and thick adhesions caused the lung to be separated with great difficulty from the chest wall. The right lung (Fig. 2) weighed almost three times as much as the left and was firm and hard in consistency.

The whole lung appeared to be studded with cavities, the walls of which were smooth and glistening. They had no fixed capsule and invariably communicated with bronchi. On slitting the bronchi it was evident that these cavities were true bronchial dilatations. Active tuberculous lesions could neither be found macroscopically nor microscopically.

BRONCHIECTASIS COMPLICATED BY PLEURAL EFFUSION. Pleural effusion is one of the most frequent complications of pulmonary tuberculosis. Indeed, in doubtful apical lesions the occurrence of an effusion frequently clinches the diagnosis of tuberculosis, whether or not tubercle bacilli are found in fluid aspirated either microscopically or by animal inoculation. But an effusion superimposed on a pulmonary lesion in the lower lobes is not necessarily tuberculous. Carcinoma of the lungs and at times bronchiectasis may be complicated by such effusions. The diagnosis in such cases is not impossible when it is remembered that tubercle bacilli are invariably present in the abundant sputum of the far-advanced tuberculous in whom physical findings reveal marked activity of the process. In the bronchiectatic the abundant fetid sputum is free from tubercle bacilli.

Furthermore, it is exceedingly rare to find a unilateral far-advanced tuberculous lesion, while bronchiectasis is most frequently unilateral and almost always involves the lower lobes. Pulmonary osteo-arthritis is most marked in bronchiectasis and the general health of these patients suffers but little in spite of the distressing cough and profuse expectoration of many years' duration. The following case illustrates the points discussed most distinctly:

CASE II.—M. K., aged forty-seven years, real estate broker, admitted October, 1916.

Family and previous personal history have no bearing upon his present trouble. For the past twelve years he has been coughing and expectorating, but never had constitutional symptoms, such as chills, fever, sweats, nor did he have hemoptysis. He did not lose weight. Four years ago he became acutely ill with pneumonia and pleurisy. He was in bed for two weeks and then improved rapidly. The cough, however, did not lessen in severity, but was even worse after convalescence. Eight months after his pneumonia his sputum became fetid in character and quite abundant; it was expelled in paroxysms and in large quantities. He had a few slight attacks of hemoptysis and noticed that when the amount of sputum diminished fever made its appearance, especially toward evening. He lost considerable weight and strength. His chief complaint has been dyspnea.

On physical examination the patient was found to be markedly cyanosed. His drumstick fingers were cyanotic and his breathing was very hurried. The right supraclavicular fossa was markedly

depressed. On percussion the right chest was dull throughout, with the exception of the base where the note was flat. Bronchovesicular breathing and a few crackles were elicited over the right apex; cavernous breathing and whispered pectoriloquy and many moist gurgling rales were heard from the second rib down, excepting over the area of flatness, where neither breath sounds nor adventitious sounds were audible. Left chest was apparently normal. Pleural effusion was diagnosed and fluid aspirated from the right pleural cavity and injected into a guinea-pig, which did not develop tuberculosis in eight weeks.

During his stay at the hospital his sputum averaged over 500 c.c. in twenty-four hours, constantly negative for tubercle bacilli. His urine was negative. He died with symptoms of bronchopneumonia two weeks after admission.

This patient gave a typical history of bronchiectasis following a pneumonic process engrafted upon chronic bronchitis. The many negative sputa and guinea-pig inoculations, the profuse and fetid expectoration, strictly unilateral involvement, the fair state of nutrition in spite of the long duration of infection, the absence of early constitutional symptoms, all pointed toward bronchiectasis as being the condition existing.

Roentgen-ray examination was of little assistance in this case, since it showed a homogeneous shadow throughout the right lung, denser at the base. It is true that in the later months the affection in this case may have been easily mistaken for pulmonary tuberculosis, complicated by pleurisy with effusion, an effusion into the pleural cavity in cases of bronchiectasis, however, is by no means infrequent.

BRONCHIECTASIS WITH PROFUSE RECURRENT HEMOPTYSIS. Hemoptysis is the most discouraging single symptom of pulmonary tuberculosis. It is also at times the first and only symptom of phthisis. Indeed, it is frequently alluded to as the pathognomonic symptom of this affection. But those who treat many pulmonary patients have seen fatal cases of hemoptyses of non-tuberculous origin, many of which were confirmed by anatomical investigation. Hemoptysis occurs almost as frequently in bronchiectasis as in pulmonary tuberculosis. The concomitant marked pulmonary osteo-arthritis, the lack of constitutional symptoms in the early period of the disease, the negative findings in the sputa, the exclusive unilateral and lower lobe involvement, clear apices on roentgen-ray examination, the comfortable and active mode of life in spite of the long duration of the disease, will point toward bronchiectasis as being the condition existing. The following case illustrates the points above mentioned most vividly:

CASE III.—A. A., aged twenty-one years, male, admitted February, 1914. Father and one brother are suffering from chronic recurrent hemoptyses, cough and expectoration. He had pneu-

monia at nine months and again at fifteen months of age. Since the second attack of pneumonia the patient has been coughing more or less constantly, more severely during the spring and fall, but growth was not retarded and his health was generally fair until he reached the age of ten years, when during a fit of coughing he noticed blood in his sputum. He therefore dates his present illness since that time. His main complaints at the time of admission are copious hemorrhages, frequently and regularly recurrent, cough and expectoration more marked in the spring and fall. He appears well nourished. His temperature, pulse and respiration are invariably normal. On admission the only physical signs elicited in the chest were dulness, with diminished respiratory murmur over both bases.



FIG. 3.—Patient A. A. Note clear apices. Marked hilus changes radiating into both lower lobes; more marked on right. Evidence of shrinking process affecting left lung; most marked at the lower lobe. Heart enlarged and probably pulled to left.

While at the hospital the hemorrhages continued. His fingers became markedly clubbed, cough and expectoration appearing at irregular intervals, but his general condition remained unaltered, his weight stationary and repeated sputum examinations proved negative for tubercle bacilli. The urine was negative; the Wassermann reaction was negative.

Roentgen-ray plate showed clear apices, marked hilus changes radiating into both lower lobes, more marked on the right. Evi-

dence of shrinking process affecting the left lung most marked at the lower lobe. Heart enlarged and pulled to the left.

During October, 1916, large moist rales were found at the left base following a hemorrhage. At this time, in view of his clubbed fingers, profuse and at times fetid expectoration, large moist rales, impaired resonance and feeble breath sounds in the left base, the fact that his body was well preserved, the negative examination of his sputa, the negative Wassermann reaction, the absence of ray fungus in the sputum and the absence of definite constitutional symptoms, a diagnosis of bronchiectasis was ventured.

In February, 1917, a bronchoscopy was performed by Dr. Sidney Yankauer, who gave the following report: "Right bronchus is normal; left bronchus is longer and broader. An abundance of pus seems to come only from the left lower lobe, the bronchus of which is filled with thick mucopus. After the removal of the pus, dense tissue closes the bronchus, which probably was granulation tissue."

The sputum at the present time averages 100 c.c. in twenty-four hours, has a somewhat sweetish odor and is still free from tubercle bacilli. Profuse hemorrhages recur regularly and there is a marked freedom from constitutional symptoms.

The latest roentgenogram (Fig. 3) shows marked hilus changes radiating into both lower lobes, with evidence of a shrinking process in the left lower lobe. The apices apparently normal.

BRONCHIECTASIS INVOLVING UPPER AS WELL AS LOWER LOBE. Signs of excavation elicited over an upper lobe are almost invariably due to pulmonary tuberculosis. Pulmonary abscess is at times encountered, but is very rare indeed and can be diagnosed with little difficulty. Upper lobe bronchiectasis is exceedingly rare and a differential diagnosis from phthisis pulmonalis requires a careful study and a long period of observation. The abundant and at times fetid sputum free from tubercle bacilli, the long duration of the disease without interfering with the working capacity of the patient and the absolute unilateral involvement, the absence of constitutional symptoms of toxemia and the marked osteo-arthritis all speak in favor of bronchiectasis. Guinea-pig inoculation of the sputum in question is of great value while roentgenological examination may help but little. The following case illustrates the points above discussed:

CASE IV.—L. C., aged thirty-seven years, tailor, admitted January, 1915.

Family and previous personal history unimportant.

Present Illness. Began with cough and expectoration following pneumonia at the age of ten years, but in spite of this he worked until two years before admission to this institution, when he was suddenly taken ill with chills, fever, cough and expectoration, which lasted about one week. The condition was diagnosed as phthisis at a sanatorium for the tuberculous.

Physical examination on admission showed a well-nourished man, dusky in appearance, suffused expression, nose bulbous, eyelids puffy, markedly clubbed fingers, cyanosed nails and marked evidence of pulmonary osteo-arthritis. The pulse was 75 per minute. The left chest was somewhat retracted, especially at the base, lagged on respiration and showed very limited expansion on deep inspiration. Supra- and infraclavicular fossæ were retracted on both sides, more so on the left. The entire left chest was markedly dull on percussion and resonance at the right apex was slightly impaired. Cavernal breathing and many moist rales were heard over the upper lobe on the left side, and feeble breathing, with few crepitant rales, over the lower lobe. Whispered pectoriloquy was very marked over the left upper lobe. Few scattered dry rales were discerned on the right side over the third and fourth interspace near the sternum.

While at the hospital the patient never showed any evidences or constitutional symptoms of toxemia. His pulse was never above 85; his weight was stationary; his cough moderate, but his expectoration averaged 475 c.c. in twenty-four hours, separating into three layers on standing, now and then foul-smelling. No tubercle bacilli could be found on forty-five examinations, many of which were made with antiformin; but streptobacilli, *Streptococcus hemolyticus* and *Micrococcus catarrhalis* were found. A guinea-pig injected with 10 c.c. of the sputum, and killed eight weeks later, showed no evidence of tuberculosis.

We may interpolate that, curiously, the tuberculosis complement-fixation in this case was 2 plus; blood-pressure 117 systolic and 75 diastolic; urine showed evidence suggestive of chronic parenchymatous nephritis. The Wassermann was repeatedly negative. He received ten injections of autogenous vaccine without any noticeable improvement. The patient finally left the hospital to seek employment.

Roentgen-ray plate showed a homogeneous shadow occupying the entire left chest, with suggestion of extensive vomica formation at the second interspace anteriorly, mediastinal organs markedly pulled to the left. The right lung was apparently clear.

This case was diagnosticated as bronchiectasis because of the following: Good nutrition, although coughing for twenty-seven years, marked pulmonary osteo-arthritis, absence of constitutional symptoms of toxemia, such as afternoon fever, sweats and tachycardia, profuse and fetid expectoration, negative sputum on examination and guinea-pig inoculation, and absolute unilateral involvement, as disclosed on physical and roentgenological examination. It is true that on superficial examination the physical signs were strongly suggestive of pulmonary tuberculosis, but bronchiectasis may involve upper lobes as well as lower lobes, while unilateral lesions in old cases of tuberculosis are extremely rare. In this

case it is most probable that the pathological changes in the lung involved were primarily due to thickened pleuræ following pneumonic processes, causing at first pulmonary fibrosis and ultimately bronchial dilatation.

BRONCHIECTASIS COMPLICATED BY ENDOMYOCARDITIS. In sanatoriums for the early tuberculous, especially those who have a large proportion of "sputum negative" cases, it is not uncommon to find cardiac cases, usually mitral disease, who have erroneously been sent there for treatment. These usually give a history of blood-streaked sputum, loss of weight, cough and perhaps slight afternoon temperature. When the signs in the lungs suggest the existence of an extensive lesion these are considered to be due to tuberculosis, the patient placed in the category of the "few cardiacs with tuberculosis," in spite of the negative findings in the sputum and absolute unilateral involvement.

Bronchiectasis and organic cardiac disease frequently coexist, and under the circumstances a diagnosis should be easily arrived at.

The following case will bring out these points.

CASE V.—R. G., janitress, aged thirty-five years, married, admitted October, 1917.

Family History. Negative. She had rheumatism at fourteen.

Present Trouble. Began about ten years ago, with cough and expectoration following pneumonia. These symptoms, while mild at first, gradually increased in severity, so that cough is now distressing and expectoration has been profuse for the past three years, and at the present time averages about 300 c.c. in twenty-four hours. There is no history of hemoptysis, chills, fever, sweats or loss of weight, although there is marked dyspnea on exertion. She gave birth to four children since the onset of the disease and apparently childbirth did not materially affect her.

On examination the patient seemed to be well nourished, but had clubbed fingers, respiration hurried, her lips, cheeks and fingernails were cyanosed, marked scoliokyphosis to the right; diminished resonance throughout the right lung and marked amphoric breathing and whispered pectoriloquy over the right middle lobe, harsh breathing and increased transmission of voice sounds over both bases. Numerous large, moist, consonating rales were very audible over both lower lobes. The heart was enlarged to left and right, and a loud systolic murmur at the apex transmitted to the left axilla and a systolic blow at the aortic area were clearly audible.

While at the hospital the temperature and pulse remained fairly normal, but the cough and expectoration were distressing, sputum averaging 300 c.c. in twenty-four hours. Repeated examinations of the sputum did not disclose the presence of tubercle bacilli. Roentgenogram showed advanced fibrosis involving practically the whole right lung, more marked at the base.

In view of the long duration of her illness, the fact that four preg-

nancies did not aggravate her condition, the absolute unilateral involvement, most marked at the lower lobe, and the negative findings in the sputum, a diagnosis of bronchiectasis was made. The organic cardiac condition and the absence of all symptoms of toxemia in spite of the profuse expectoration and distressing cough practically rules out phthisis pulmonalis.

BRONCHIECTASIS IN YOUNG ADULTS. In ordinary sanatorium practice one is particularly impressed with a group of cases which could be classed among the "fat tuberculous," but present a clinical history and physical signs entirely incompatible with pulmonary tuberculosis. These patients are between the ages of fourteen and sixteen years, give a history of cough and expectoration of many years' duration following a pneumonia or pleurisy. They are usually well nourished, in fact somewhat overweight, active and happy. They deny such constitutional symptoms of toxemia as chills, fever, sweats and tachycardia, which are most marked in the tuberculous of this age. They present a suffused expression, puffy eyelids, bulbous nose and markedly clubbed fingers, and physical examination discloses an extensive involvement of one of the lower lobes, with evidence of sacculatation and cavity formation and a great deal of moisture. Their sputum is fetid and abundant, brought up in mouthfuls periodically, and is free from tubercle bacilli.

A differential diagnosis in such cases is not difficult if we bear in mind that the young tuberculous, with involvement of the lower lobes, are hectic, emaciated and soon moribund, and tubercle bacilli are invariably present in their profuse expectoration. In such cases both upper lobes are also extensively involved and a definite history of toxemia is invariably given. On the other hand, patients suffering from bronchiectasis are well nourished, comfortable, active, give no history of toxemia, show no evidence of upper lobe involvement, their extensive lesion is at either lower lobe but almost always unilateral and their profuse expectoration is free from tubercle bacilli. Roentgenographic examination, although it will not show more than indefinite shadows at the site of the lesion, will almost invariably disclose clear apices. Bronchiectasis in these cases is the end-result of chronic shrinking processes, due to thickened pleuræ of non-tuberculous origin or interstitial pneumonia. The following four cases are a few of the many cases under our observation, which illustrate the points discussed above:

CASE VI.—S. M., female, aged fourteen years, admitted March, 1915.

She had diphtheria at three years and lobar pneumonia in the left lung at eleven years, which did not end by crisis.

PRESENT ILLNESS. Began with pneumonia three years ago, which was followed by persistent cough and expectoration and gradual development of dyspnea on exertion. She did not have

such constitutional symptoms as recurrent chills, fever and sweat, gained in weight normally, but noticed blood-streaked sputum at times, and was aware of the fact that her fingers became clubbed.

On physical examination we found a well-nourished young girl, cheeks, lips and nails slightly cyanosed, fingers markedly clubbed. Left chest lagged on respiration and there was marked retraction in the supra- and infraclavicular spaces. A dull percussion note was elicited on the left chest from the third space to the base anteriorly, and from the inferior angle of the scapula to the base posteriorly the note was very dull. The left apex, however, was apparently clear. Over the dull area large moist consonating rales could be heard both anteriorly and posteriorly, and bronchial breathing and whispered pectoriloquy could be discerned from the angle of the scapula to the base. The heart was pulled somewhat to the left. The right apex showed mild impairment of resonance and harsh breathing. A roentgenogram disclosed increased density of both roots, radiating into both lower lobes, more marked on the left side.

While at the institution the patient had recurrent attacks of slight hemoptysis; the pulse and temperature, however, were about normal; blood-pressure was 95 systolic and 65 diastolic. Urine and Wassermann reactions were negative. Weight remained stationary. Sputum was profuse and at times fetid, and numerous examinations for tubercle bacilli were negative.

In view of the extensive unilateral lower lobe involvement the absence of constitutional symptoms, such as chills, fever, sweats and tachycardia, good nutrition and fair health, in spite of the persistent cough and expectoration, the negative Wassermann reaction, the negative results on examination of the sputum, a diagnosis of bronchiectasis was made.

CASE VII.—F. B., aged fifteen years, admitted September, 1918. The patient had pleurisy and pneumonia in infancy.

On admission, complained of cough and expectoration of many years' duration. About six months prior to admission the patient realized that her cough had gradually become more distressing and expectoration more abundant and at times fetid and that her fingers were markedly clubbed. Pain in the left chest was also complained of. No history of constitutional symptoms of toxemia could be obtained.

On examination we found a well-nourished, robust young girl, slightly cyanosed, with bulbous nose, suffused expression and puffy eyelids. Her fingers were markedly clubbed. Left chest lagged on respiration and distinct signs of sacculation or cavity formation, with numerous large moist rales, were elicited over the left lower lobe anteriorly and posteriorly. Her heart was pulled to the left. Right lung was negative.

While at the hospital the patient had numerous slight attacks

of hemoptysis; cough was distressing. Sputum averaged 180 c.c. in twenty-four hours and was at times fetid. Her temperature, pulse and respiration remained normal. The sputum was free from tubercle bacilli. The urine was negative. Von Pirquet was slightly positive on two occasions and tuberculosis complement-fixation was 2 plus. Roentgenological examination (Fig. 4) revealed dense shadow in the region of the left lower lobe, with heart pulled to the left, but the apices were clear.



FIG. 4.—Case F. B. Note clear apices. Marked bilateral hilus changes. Dense homogeneous shadows at left lower lobe. Heart pulled to left.

On account of the unilateral lower lobe involvement, clear apices on physical and roentgenological examinations, the negative findings in the sputum, the excellent health in spite of distressing cough and expectoration of long duration and the absence of constitutional symptoms of toxemia, a diagnosis of bronchiectasis, possibly due to thickened pleura, was arrived at.

CASE VIII.—J. L., aged seventeen years, schoolboy, admitted September, 1918.

Family and previous personal history unimportant.

Present Trouble. Began five years ago with moderate cough and expectoration, which greatly increased in severity, so that the cough is now distressing and the sputum profuse, extremely fetid, frequently blood-streaked and brought up in paroxysms of distressing cough, usually early in the morning, influenced by posture. He gained normally in weight, going hand in hand with his growth in

height, and is vigorous and healthy otherwise. He does not remember ever having had constitutional symptoms such as chills, fever, sweats and tachycardia.

On examination we found a very well-nourished young adult, nose markedly bulbous, eyelids puffy, lips, cheeks and nails markedly cyanosed and fingers exquisitely clubbed. Respiratory excursions were markedly diminished throughout the left chest and a dull note on percussion was elicited over both lower lobes, more extensive and marked on the left side. The auscultatory signs suggested the presence of extensive excavation or sacculation over the left lower lobe, and increased whispered voice and many large moist conso-



FIG. 5.—Patient J. L. Note clear apices. Considerable density at both roots radiating into the lower lobes; more marked on left side with suggestive evidence of dilated bronchi at the left base.

inating rales were heard over the dull areas. Heart was pulled to the left. Both flat and stereoscopic roentgenograms (Fig. 5) showed clear apices and considerable density of both roots radiating into the lower lobes, more marked on the left side with suggestive evidence of possible dilated bronchi at the left base. Bronchoscopy by Dr. E. Danziger showed a widened left bronchus with pus coming from the lower lobe.

While at the hospital the patient did not have any constitutional symptoms of toxemia. He gained in weight normally; fifty sputum examinations were negative; urine, Wassermann and tuberculosis complement-fixation were all negative. Cough, however, was

distressing and sputum averaged 200 c.c. in twenty-four hours, extremely fetid and frequently blood-streaked.

CASE IX.—M. G., schoolboy, aged eighteen years, admitted March, 1918.

Family and previous personal history irrelevant.

Present Illness.—Began two and a half years ago with cough and expectoration, which gradually increased in severity until six months ago, when the sputum averaged about 400 c.c. in twenty-four hours and was often blood-streaked. Despite the absence of constitutional symptoms of toxemia a diagnosis of tuberculosis was made and he was sent to us for treatment.

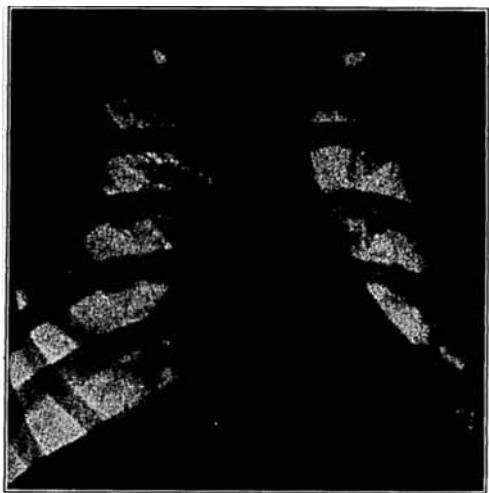


FIG. 6.—Patient M. G. Note clear apices. Marked hilus changes radiating into the lower lobes on both sides.

On admission the patient was well nourished, cyanotic, suffused expression, nose bulbous, markedly clubbed fingers. Physical exploration of the chest disclosed dullness over both lower lobes with greatly exaggerated breathing and many large moist rales with increased whispered voice over the dull areas. No pathological changes could be discerned at either apex. There was a soft systolic murmur at the apex of the heart, but it was not transmitted.

While at the hospital the temperature, pulse and respiration remained normal, but cough and expectoration were very distress-

ing, sputum averaging 450 c.c. in twenty-four hours; markedly fetid and brought up in paroxysms of distressing cough. No tubercle bacilli could be found in the sputum on numerous examinations.

The Wassermann and tuberculosis complement-fixation and the urine were negative. Roentgen-ray examination (Fig. 6) revealed clear apices and marked hilus changes radiating into the lower lobes. Bronchoscopy by Dr. E. Danziger showed a widened right bronchus, with pus coming from the lower lobe.

DISCUSSION. Bronchiectasis is very often confused with pulmonary tuberculosis because many of the symptoms, physical signs and, at times, the roentgenograms of the two bear a striking resemblance to each other. It is apparent that a differential diagnosis is urgently called for, since the patient may be detained as a germ carrier by diligent health officers. The prognosis is also more favorable in advanced tuberculosis.

The factors entering into the causation of bronchiectasis have been variously described. As early as 1838, Corrigan insisted that cirrhosis of the lung was the usual cause of bronchiectasis. A few years later Charcot pointed out that bronchiectasis occurs as a sequel of bronchopneumonia, in which there was a destruction of the muscularis and elastic coats of the bronchi.

The consensus of opinion at the present time is that bronchiectasis is due to a combination of causes within the bronchi and causes external to the bronchi. Among the causes of bronchiectasis emanating from within the bronchi, acute and chronic bronchitis, pertussis and foreign bodies are best known. In such cases there exists an inflammatory process in the walls of the bronchi due to local infection which tends to paralyze the underlying muscle tissue. The cartilages of the bronchi do not form perfect rings, *i. e.*, yellow elastic tissue joins the ends of the cartilage to complete the ring, and the amount of cartilage in each ring diminishes as the bronchi subdivide into the branches of smaller caliber.¹ During cough the pressure within the bronchi may rise from normal—2 mm. of Hg. to 100 mm. of Hg. and even higher.² The increased pressure, exerted upon the paralyzed musculature and incomplete cartilaginous rings, tends to dilate the bronchi at their most vulnerable points.

Bronchiectasis is also the characteristic sequel of an obstructed bronchus produced by the impaction of a solid foreign body. The local irritation and subsequent infection thus produced causes an increased secretion beyond the point of obstruction, which can never be completely expelled, and a fermenting residue remains. A septic bronchitis is thus produced and the inflammatory changes

¹ Gray, H.: *Anatomy*, p. 1197, Lea & Febiger, Philadelphia and New York, 1910.

² McPherdan, A.: *Osler's Modern Medicine*, iii, 636, Lea & Febiger, Philadelphia and New York, 1907.

decrease the tonicity of the bronchi. The chronic inflammatory process spreads to the peribronchial tissue and then to the lung, with the inevitable result of pulmonary fibrosis, shrinking of the lung tissue and dilatation of the affected bronchi. The rending effect of the cough in case the obstruction is incomplete further augments the bronchiectasis.

Chronic interstitial pneumonia and thickened pleura of non-tuberculous origin are the extra bronchial causes of bronchiectasis. In chronic interstitial pneumonia, fibrous growth replaces the normal texture of the parenchyma, and more or less collapse of that part of the lung is produced. The connective tissue thus formed, by virtue of its contraction, tends to dilate the nearest bronchi. This mechanism is further augmented by the inspiratory act which permits the atmospheric pressure to dilate the bronchi, traversing the collapsed and non-expanding lung tissue.

It is conceivable that the recession of the chest wall during the act of inspiration is a most potent factor in dilating the already weakened bronchi. It is well known that firm pleuritic adhesions binding the collapsed and fibrosed lung tissue securely to the chest wall are almost invariably found in these cases. The inspiratory recession, therefore, causes the chest wall to pull directly on the walls of the bronchi. When dilatation of the bronchi is once begun the stagnating bronchial excretion by its devitalizing actions markedly decreases the tonicity of the bronchi, and some passive dilatation is also produced. These mechanisms of bronchiectasis similarly hold good in cases of old standing empyemata and greatly thickened pleurae associated with changes in the vesicular texture of the underlying lung.

In the diagnosis of bronchiectasis the history of the onset is most important. In bronchiectasis resulting from causes other than a foreign body the symptoms appear most insidiously. The patient has usually been coughing and expectorating for many years following a pneumonic process. He gives no history of constitutional symptoms of toxemia such as tachycardia, recurring chills, fever and sweats, nor does he claim to have lost in weight, as is the case in tuberculosis. He does not complain of lassitude in the afternoon hours and leads a moderately active life. Hemoptysis at once considered pathognomonic of tuberculosis, occurs almost as frequently in bronchiectasis. The excessive amount of sputum expectorated is not as important as the manner in which it is brought up. In bronchiectasis it is raised spasmodically in mouthfuls, usually in the early morning hours after a restful night. The expectoration is most markedly influenced by posture. The abundant sputum may be fetid, but not necessarily so, and its separation into three layers is of no diagnostic significance, since sputum of most advanced tuberculous, when abundant, will exhibit the same phenomena. The patient usually presents a suffused

expression, puffy eyelids and bulbous nose in contradistinction to the emaciated, flushed appearance of the tuberculous.

Since bronchiectasis is secondary to a variety of chest conditions the physical findings will frequently be those associated with the condition preceding bronchiectasis. Physical examination may be quite disappointing in the early stages of the disease and signs usually noted are similar to those of chronic bronchitis. It is only later in the disease that clubbed fingers and marked pulmonary osteo-arthropathy are noted. This occurs more frequently in bronchiectasis than in any other pulmonary affection, save abscess of the lung. The ordinary cases of bronchiectasis, however, are not seen very early, and when they do present themselves for treatment, the signs most usually elicited are impaired resonance over the affected area, with auscultatory evidence of congestion, sacculatation or cavity formation, most usually unilateral and almost invariably at the lower lobe. The hemothorax affected shrinks in all diameters and the mediastinum is pulled to the side affected just as frequently as in tuberculosis. The upper lobe of the same side may share the pathological changes of the lower lobe,³ but when the disease continues and passes, so to say, to the other side it is again the lower lobe that is first affected.

Pathological changes in pulmonary tuberculosis almost invariably spread from above downward. In bronchiectasis the reverse is true. It is a fact of extreme importance to note that bronchiectasis most usually affects the lower lobe, and is most frequently unilateral. Its occurrence in an upper lobe exclusively has been recorded, but is very rare indeed.

Laboratory findings at times may not be of assistance in the differential diagnosis, except, of course, when tubercle bacilli are found in the sputum. Guinea-pig inoculation with the sputum in question may rule out active tuberculosis.

Roentgenograms, although invaluable in certain cases, may be very misleading at times when the disease has spread so as to affect the upper as well as the lower lobe. When showing clear apices the plate is of extreme diagnostic value in ruling out tuberculosis. Slight shadows at the base, however, which is all we frequently see in typical cases of bronchiectasis, cannot usually be correctly interpreted and very often definite sacculations, found on physical examination and confirmed by anatomical investigation cannot be seen either on flat or stereoroentgenograms.

The tuberculosis fixation test, at first heralded as being of extreme diagnostic importance, has misled us in a few cases, and should therefore not yet influence us in making a definite differential diagnosis.

³ Report of Work of Pathological Department of Brompton Hospital, Tab. VIII, p. 33.

SUMMARY. A diagnosis of bronchiectasis may be arrived at only after a careful history of the case has been taken and painstaking repeated physical examinations have been resorted to. Given a patient with a history of cough and profuse expectoration of many years' duration following pneumonia, yet well nourished, leading a moderately active life, especially when no history of such constitutional symptoms as tachycardia, chills, fever and sweats can be obtained, and the abundant sputum after repeated and careful examinations does not show the presence of tubercle bacilli, it is most probable that the disease in question is not tuberculous in character, although hemoptysis may have been complained of. When this is supplemented by repeated physical explorations of the chest, which show that the lesion is to be found exclusively at either or both lower lobes and the apices are free from disease, a diagnosis of bronchiectasis may be justifiable. Guinea-pig inoculation of the sputum in question may rule out tuberculosis. Roentgenogram and at times bronchoscopy may be of assistance. Tuberculosis complement-fixation is not as yet to be relied on. It must be emphasized that extensive basal tuberculosis is most frequently a terminal condition and is associated with bilateral upper-lobe involvement and marked constitutional symptoms of toxemia.

I wish to express my indebtedness to Dr. Maurice Fishberg and Dr. Alfred Meyer, from whose services the report of the cases was taken, for their valuable suggestions.

A CASE OF ENLARGED THYMUS GLAND AND SOME REMARKS ON STATUS LYMPHATICUS.¹

BY RICHARD COLE NEWTON, M.D.,

CONSULTING PHYSICIAN TO THE MOUNTAINSIDE HOSPITAL, MONTCLAIR, N. J.

W. S., aged twenty years, 5 feet 6 inches tall; weight, 145 pounds. A patient of Dr. William F. Grady, of Montclair, presented the following history and symptoms.

Family History. Negative.

Personal History. Negative.

Present Condition. Patient has always been well. No similar case is known to have occurred in any member of his family, immediate or remote. In the spring of 1917 the patient undertook strenuous farm work near Greenwood Lake, N. J. Once after exhausting labor he jumped into the lake when overheated. He swam a considerable distance. No immediate untoward effects were noticed, but in about two weeks he began to complain of lassitude and loss

¹ Read by title before the American Climatological and Clinical Association at Atlantic City, June 17, 1919.